

Subsistence Economy During the Iron Age in Northwestern Iran: The Case Study of Tepe Hasanlu

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Abstract

Northwestern Iran is one of the key regions in the archaeological researches, especially during the Iron Age. Tepe Hasanlu is an important ancient site due to its long-term occupation and extensive excavations, with relatively complete studies. This paper dealing with the results of recent archaeozoological researches of Hasanlu, to complete the lack of studies on the subsistence economy of the site. The studied faunal remains of Hasanlu derived from campaigns of 1970, 1972 and 1974, which are housed in the Osteology Department of the National Museum of Iran. This paper intends to examine the subsistence economy and animal exploitation patterns during the Iron Age in Tepe Hasanlu. The faunal remains of Middle and Late Bronze Age and Historic period also evaluated to better perception of changes and evolutions in subsistence strategies of Iron Age. The results of studies pointed to the developed animal husbandry during all periods of Hasanlu, which domesticated sheep and goats, and cattle were the most important exploited resources. Equids also allocated the considerable portion of the collection which especially bred in Iron Age. The same pattern identified in contemporaneous sites such as Haftavan Tepe and Dinkhah Tepe in northwestern Iran.

Keywords: Northwestern Iran, Archaeozoology, Faunal Remains, Animal Husbandry.

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Introduction

The Iron Age, which covers the middle of the second millennium BC to the middle of the first millennium BC, is a highly scrutinized period in terms of the evolution of cultures in the archaeology of Iran. The cultural, economic, and social developments during this age underlined the emergence of the Mannaeen (Iron Age II) and Median (Iron Age III) governments, which consequently gave rise to the Achaemenid Empire in Iran. Iranian and Foreign archaeological studies that focused on this period paid attention to various subjects, such as cultural continuity or change from the Bronze Age to the Iron Age, the typology of material culture, settlement patterns, and the debate regarding the Indo-Iranian migration (e.g., Ghirshman, 1938; Dyson and Muscarella, 1989; Young, 1965, 1967; Burney, 1994; Medvedeskaya, 1982; Hejebri Nobari, 2004 Talai, 2007). In the context of the Iron Age, northwestern Iran was always considered a key region of cultural development and interaction among various ancient powers and peoples. This significant role was also indicated in the systematic archaeological projects carried out in the region.

Robert Henry Dyson Jr. (1969, 1972, and 1989) directed the purposeful project of the University of Pennsylvania Museum and the Archaeological Service of Iran in northwestern Iran from 1956 to 1977. The project was aimed primarily at investigating the prehistoric cultural sequences and the development of the Iron Age in the region, with Tepe Hasanlu selected as the principal site for excavations. Among the key archeological sites of northwestern Iran, Hasanlu is critical because of its long-term occupation and well-defined stratigraphy. Studies

have been conducted on Hasanlu materials and finds, including architecture, metal objects, pottery, burials, seals, ornaments, and human skeletons (e.g., Dyson, 1965, 1989a & b; Dyson and Muscarella, 1989; Muscarella, 1971; Young, 1965; Marcus, 1989a & b; Magee, 2008; de Schauensee, 2012; Danti, 2013a & b; Danti and Cifarelli, 2015; Cifarelli, 2014). By contrast, few studies have been directed toward the subsistence economy in Hasanlu and the strategies by which people interacted with the environment.

Fortunately, substantial, large, and well-preserved animal remains of Tepe Hasanlu were kept and curated at the National Museum of Iran (Mashkour et al, 2012). This collection belongs to the last seasons of excavation in 1970, 1972 and 1974, which was not studied before. The study of the faunal remains began officially after a long period of sorting and curating in September 2013 at the National Museum of Iran within a PhD project (Davoudi, in prep.), which the results are presented here. This paper deals with examining the animal exploitation and subsistence patterns in Tepe Hasanlu during Iron Age. The faunal remains of prior Middle and Late Bronze Age, and later Achaemenid and Seleuco-Parthian (Historic) periods also examined in diachronic approaches, in order to better understanding of changes and continuities in subsistence economy at Hasanlu.

Tepe Hasanlu: Excavations and Chronology

Tepe Hasanlu is located in Solduz Valley, Western Azerbaijan province of Iran. The site situated 12 km southwestern of Lake Urmia and 9 km far from northeastern of Naqadeh city (Fig. 1). The marshy areas offer an appropriate climate for the development of mixed farming and

herding. The site consists of two distinct topographic zones: a High Mound which is called 'Citadel Mound', surrounded by a Low Mound, also known as the 'Outer Town'. The High Mound is 200m in diameter and rises 25m above surrounding plain. The Low Mound measures 600m across its widest point and rises 6-7 meters above modern plain (Dyson, 1989a: 107) (Fig. 2).

Tepe Hasanlu has a long history of excavations and researches (see Dyson, 1989b; Muscarella, 2006). The first archaeological excavations in the High and Low Mounds had been carried out by Sir M. Aurel Stein in 1936 (Stein, 1940), and then, by Ali Hakemi and Mahmud Rad in 1947 and 1949 (Hakemi and Rad, 1950). The systematic excavations were conducted by the joint project of University of Pennsylvania Museum, the Metropolitan Museum of Art of New York and the Archaeological Service of Iran from 1956 to 1977 during 10 campaigns under the general direction of Robert Henry Dyson, Jr. (Dyson, 1969, 1972, 1989b; Danti, 2004, 2013a). The reconsideration excavation of Upper Strata was the last field project at Hasanlu by an Iranian team under the leadership of Hamid Khatib Shahidi in 2000 (Shahidi, 2006).

According to the excavations' results, the site was intermittently occupied during 10 different cultural periods from the Late Neolithic (period X), circa the second half of 6th millennium BCE, to the Ilkhanid dynasty in the 13th century CE (period I) (Dyson and Muscarella, 1989). The most investigated periods in the site are the Late Bronze and Iron Age, because of the large exposure of these periods during the excavations and the focus of publications (Dyson, 1975, 1989a; Dyson and Piggot

1975 Danti, 2013b; Danti and Cifarelli, 2015). Material culture from the Neolithic to the Middle Bronze Age had been discovered from deep soundings and stratigraphic trenches, however with no complete architectural spaces (Danti et al, 2004). The Late Bronze Age and Iron Age deposits have been excavated extensively in horizontal operations in Citadel Mound and Outer Town, which resulted to discovering of structure of buildings, thousands of artefacts in closed contexts, and the massive faunal remains.

The chronology of Hasanlu, which has been debated especially in relation to the Iron Age and Historic periods, was published in Dyson's articles (e.g., 1958, 1965, 1968, 1983, 1989b) and in the book *Chronology of Iran* (Voigt and Dyson, 1992). Dyson's chronological framework is almost accurate, but recent researches on Hasanlu materials (especially pottery), and absolute dating have prompted revisions to some levels and sub-levels of Hasanlu chronology. On the basis of the Hasanlu reconsideration project, for example, Hamid Khatib Shahidi (2006) argued that level IIIa belongs to the Median Empire and that level II must be divided into two sub-levels, namely, (1) IIb or the Achaemenid Empire and (2) IIa or the Seleucid government. Michel Danti (2013a) also recently revised the chronological development of the Bronze Age and Iron Age in the site, which the scholar indicated as corresponding with Hasanlu periods VI, V, and IV. He used the term "Monochrome Burnished Ware" (MBW) to refer to the horizons of gray wares in the Bronze Age and Iron Age. He further contended that MBW existed from the late Middle Bronze period to the end of Iron II within the Hasanlu and Dinkhah assemblages. The evidence provided by

the researcher indicated inter-regional developments and continuity of cultures in northwestern Iran from the Bronze Age to the Iron Age (Danti, 2013a: Tab. 17-1, 2013b: Fig. 2-2).

Stephan Kroll (2013) revised the chronology of Hasanlu period III, which he divided into three phases: periods IIIc and IIIb - attributed to Iron Age III (Urartian period) - and after a hiatus in between, period IIIa - related to the Achaemenid Dynasty, for which no substantial architectural remains have been found. Period II is also a debated issue but generally assigned to the Seleucid or Parthian period, post-Achaemenid (Dyson, 1959: 9, 1999: 101). In this paper, we used the recently revised chronology in examining faunal remains (Table 1).

Table 1: The periods of the studied faunal assemblage of Hasanlu based on revised chronology (Danti, 2013a: Tab. 17.1, 2013b: Fig. 2.2; Kroll, 2013: 184, 190).

Period	Date (BC)	Phase
Seleuco-Parthian	3 rd century	II
[Late] Achaemenid	400-330	IIIa
Iron III / Urartian	800-600	IVa - IIIb
Iron II / Mannaeans	1050-800	IVb
Iron I	1250-1050	IVc
Late Bronze / Beginning of Iron	1450-1250	V
Middle Bronze 3	1600-1450	VIa
Middle Bronze 2	1900-1600	VIb
Middle Bronze 1	2100-1900	VIc

Archaeozoological Background of the Region

Dyson (1962: 9) and Danti (2013b: 6-7) generally discussed about the economy of Tepe Hasanlu and mentioned to the cattle, sheep and goats as the main source for food and other productions during the Late Bronze and Iron Age. Sandor Bökönyi just reported 21 animal species identified on the assemblage of the 1972 campaign, however no archaeozoological report has ever published (Dyson, 1973: 195). Only some pictures of horse skeletons of Hasanlu IVb and other animals within the collapse of Burned Buildings and graves were published in several papers, mostly relating to other subjects and cultural materials without any archaeozoology analysis (e.g., de Schauensee, 1989). The first archaeozoological results and with a particular focus on the Iron Age were those reported by one of authors (H. Davoudi) as a poster in the 12th International Council for Archaeozoology. Significant archaeozoological studies on Iron Age sites in northwestern Iran have been carried out for the last four decades. The sites of interest include the Bastam (Krauss, 1975; Boessneck and Krauss, 1973), Haftavan Tepe (Mohaseb 2012), Kordlar Tepe (Lippert 1979), Tepe Dinkhah (Gilbert and Steinfeld 1977), Takht-e Suleiman (Kolb, 1972) and Qalaychi (Nezamabadi et al. 2011). With regard to the Central Zagros region, archaeozoological research on Godin Tepe (Gilbert, 1979) and Tepe Nushijan (Bökönyi, 1978) are very important studies for comparison.

Animals in Historical Records and Archaeological Findings

Historical records and other archaeological finds can enhance our knowledge of

animals and their presence in ancient times. On the basis of ancient records regarding the Neo-Assyrian Empire and the annals of Assyrian kings, the southern part of Lake Urmia can be assigned to the jurisdiction of the Mannaeen government. Period IV of Tepe Hasanlu was allocated by excavators and other scholars to the Mannaeans (e.g., Dyson, 1960, 1967; Salvini, 1995: 25) or to the independent state of Mannaeen territory, such as Gilzanu (e.g., Reade, 1979).

One of the important New-Assyrian annals is the “Black Obelisk” of Shalmaneser III (858–824 BC), which was discovered in a central building in Nimrud. The sculpture contains inscriptions on its four sides - a record of the king’s military achievements from the year of accession to the 31st year of reign (Luckenbill, 1926: 200). With his army, the king of Assyria attacked northwestern Iran in his 31st year of reign and claimed the following: “... Against Gilzanu I descended. The tribute of Upu, the Gilzanite, of the Man – rites, the – burisites, the Harranites, the Shaahganites, the Andites, the – rites, – cattle, sheep, horses, broken to the yoke, I received ...” (Luckenbill, 1926: 210); “Tribute of Sua, the Gilzanite. Silver, gold, lead, copper vessels, staves for the hand of the king, horses, camels, whose backs are two humps, I received from him.” (Luckenbill, 1926: 211); “To the land Gilzanu I drew near. Asau, king of Gilzanu, together with his brothers, his sons, came out against me. Tribute and gifts royal self, - horses, broken to the yoke, cattle, sheep, wines, seven camels, whose humps are double, I received from him.” (Luckenbill, 1926: 220).

Some archaeological objects that were discovered during the excavations also increase knowledge about animals in

Hasanlu. Images of animals, including sheep, goats, horses, and deer, can be found on the seal and sealing of objects, on glass and stone vessels, and on other artifacts. Animals were represented in various scenes, such as deer hunting, horse riding, and animals near trees, which are generally related to real or mythical narratives (Fig. 3).

Faunal Remains in Hasanlu

As mentioned above, the faunal remains of Hasanlu are housed in the National Museum of Iran. At the first step of curating project, the archaeological information of bags registered in the data base and then we sent them to Michael Danti, Prof. at archaeology in Boston University and his research assistant Kyra Kaercher, now in charge of Hasanlu Publication Project, for the control of the chronological context of the bone remains. Each animal bone for which no reliable chronological data have been obtained was eliminated from the study. After the bones in the collection were washed and processed, all related information and observations were registered in an Excel database. The recorded data include species, number of remains, weight, bone position, epiphyseal fusion, right or left side, cut marks, traces, and biometry. In the collection, a remarkable number of bones are intact, making these bones valuable finds for taxonomic distinction and biometrical analysis.

The examination of the collection was carried out entirely in the Department of Osteology of the National Museum of Iran. For taxonomic identifications of some mammalian bones, we used the comparative collection of the Archaeozoology section in the Archaeometry Laboratory of the

University of Tehran. Basic anatomical atlases were also used to identify species (e.g., Barone, 1986; Schmidt, 1972; Pales and Garcia, 1981; Pales and Lambert, 1971). The two main quantification measures adopted were Number of Identified Specimens (NISP) and weight (gram). We employed these measures to estimate the frequency of each species in the collection. Weight was examined to determine the relative importance of a species (Casteel, 1978). Some bones, for which no criteria of identification have been established, were classified under border categories; unidentified bones were sorted into large and medium mammalian groups according to specimen size. Biometrical methods were also used to reconstruct the size of each animal species, compare it with the same animals found in other sites, and distinguish between domestic and wild individuals (Davis, 1987: 37–38). For bone biometry, we used the standard codes of measurement published by Von den Driesch (1976).

In total, 12425 bones (378.5 kg) from Tepe Hasanlu were examined. The faunal remains include fragmented and intact bones. The identified bones represent 54% of the total Number of Remains (NR). The distribution of bones within cultural periods is presented in Fig. 4.

Faunal Spectra

The bone assemblages of animals discovered in Hasanlu were classified into four main categories, namely, identified species, large and medium mammals, small ruminants, and unidentified bones. Identifiable bones, which were counted precisely, constituted the main quantitative parameter used in the analysis and were represented via the NISP.

A total of 6716 bones (54%) from the collection were taxonomically identified, and 5709 specimens (46%) that have no taxonomical indications were sorted as large and medium mammals, namely, Bovidae, Equids, Cervidae, and Suidae. The small ruminant category includes the bones of Caprinae and gazelle. The bones for which no anatomical and taxonomical indications of distinction have been established were classed as unidentified bones (Fig. 5). These bones account for 18% of the weight of the collection, indicating the good preservation of the identifiable bones and the small and fragmented nature of the unidentified remains. The identified Hasanlu species were divided in three main classes: mammals, birds, and reptiles. We focused on mammals in this work, reserving a more detailed description of birds and reptiles in ongoing studies.

Mammalia

Bovidae is the most commonly occurring species family in the collection. Generally, 2024 bones belong to cattle (*Bos taurus*), 994 bones to sheep (*Ovis aries*), 765 bones to goat (*Capra hircus*), 7 bones to gazelle (*Gazella subgutturosa*), 3 bones to wild sheep (*Ovis orientalis*), and 1 bone to wild goat (*Capra aegagrus*). Of the collection, 2094 bones have no criteria for identifying whether they are sheep or goat species and were therefore allocated to Caprinae. A total of 46 bones belong to the Cervidae family, allocated specifically to red deer (*Cervus elaphus*) according to morphological indications (Fig. 6).

The Equidae family comprises domesticated animals. In this group were classed 274 bones, of which horse (*Equus caballus*) and ass (*Equus asinus*) are the main species (Fig. 6H). In the collection, 5

bones were distinguished as belonging to the Camelidae family according to examinations of the humerus, first phalanx, radius, and ulna (Steiger, 1990). A total of 129 bones of the Suidae family were attributed to boar (*Sus scrofa*) (Fig. 6C). The Canidae family consists of 153 bones, most of them (131 bones) belonging to domesticated dog (*Canis familiaris*). Additionally, 2 skulls of fox were identified; the 2 bones of badger (*Meles meles*) and 2 skulls of least weasel (*Mustela nivalis*) defined in the collection can be assigned as intrusive species. Finally, 20 bones of carnivore were determined as having no indications for taxonomy.

Birds and reptiles

A total of 93 bones of various bird species were identified in the collection. The taxonomic identification of these bones need more detailed study. The main species belong to the orders Anseriformes and Pelecaniformes, which are common in the environment of Lake Urmia. Reptiles were represented by only 4 shells of turtle (*Testudo graeca*). We assigned birds, rodent, reptiles, and mollusks to minor taxa.

Taphonomy and Bone Preservation

The human activities and environmental conditions in Hasanlu had affected the bones. The observation of these taphonomical traces can advance the identification of consumption patterns and post-depositional processes. Traces of animal exploitation by humans and the manner by which carcasses were divided, butchered, and burned are identifiable on the bones (Rackham, 1994).

The taphonomical identifications on the skeletal elements of cattle and Caprinae

(sheep and goats) indicated that all parts of a skeleton were included in the assemblage. The frequency pattern and existence of all skeletal parts showed that these species were slaughtered in the site. Notably, bones of the body and limbs constitute the largest number of parts in the aforementioned species (Figs. 7 and 8). Note that 941 astragali of Caprinae, which were all found in a same context of the Iron II period, were eliminated from the skeletal parts in figure 8. These finds suggest specific practices.

The highest levels of traces on the animal bones relate to anthropogenic activities. Carbonization is a common category, with the animal bones burned, calcined, and heated. Most of the bones that reflect carbonization were discovered in the ashy layers and culinary spaces of Hasanlu. Incision and heavy cut marks during butchering and slaughtering are other common traces on the bones of 278 specimens, especially on hammy bones, such as the humerus, femur, tibia, and tarsal and carpal bones. The presence of some cut marks on the bones of horse, badger, and birds is interesting. The use of bones as tools and ornamental objects was distinguishable via traces of modifications (Fig. 6F). For instance, many horn cores of cattle and goat were cut from the base; the same modification was observed in all the antlers of deer. The highest traces of human activities were observed in the skeletal parts of cattle and Caprinae - traces that reflect their importance in the subsistence economy of Hasanlu (Fig. 6E). Other traces relate to animal activities. The most frequently occurring animal traces are carnivore biting and gnawing (128 bones), which could have been caused by canids (e.g., *Canis familiaris*). These traces were generally observed on the bones of

cattle, Caprinae, and horse (Fig. 6K). Traces of effects from environmental factors, such as weathering and plant roots traces are rare in the collection. This can explain the good preservation condition of the bones after accumulation. Traces of labor stress, although interesting, are also rare. The identification of some pathological elements on the cervical vertebra and first phalanges of cattle indicated the probable use of this species as draught animals (Fig. 6J).

Domestic Animals and Herding Strategies

Sheep and goats and cattle were the most abundant animals in all periods, as determined from NISP averages of 53.8% and 30.6%, respectively. Equids, dog, and camel had NISPs of 4%, 3.9%, and 0.07%, respectively. The animal weights also pointed to the importance of cattle (57.2%) and Caprinae (20.1%) for meat production (Fig. 9). The identified domestic species that were introduced into the subsistence economy of Hasanlu during cultural periods are as follows:

Caprinae: The average number (53.8%) and weight (20.1%) of Caprinae indicated that this family was quantitatively the most dominant group in Hasanlu. The occurrence of Caprinae in the collection was as follows: 55% NISP during the Middle and Late Bronze periods, 42.2% NISP in Iron III, 45.4% NISP in the Achaemenid-Seleuco-Parthian period, and 72.8% NISP in Iron I and II (Fig. 9). For the first three periods, Caprinae accounted for half of the identified taxa, but this proportion increased to two-thirds of the collection for the Iron I and II periods.

Cattle: The second most dominant animal in Hasanlu was cattle (*Bos taurus*). Domestic water buffalo (*Bubalus bubalis*) was also present in northwestern Iran

(Uerpmann, 1987); some bones of Bovidae can be allocated to this species. The occurrence of cattle in the collection was as follows: 22.8% NISP during the Middle and Late Bronze period, 21.8% NISP in Iron I and II, 39.8% NISP in Iron III, and 38.3% NISP in the Achaemenid-Seleuco-Parthian period (Fig. 9). These values indicated an increase in the consumption of cattle in the Iron III and Historic periods. This pattern may have resulted from the development cattle breeding at the site.

Equids: Equid remains were discovered in all periods of Hasanlu, and the remains generally belong to horse (*Equus caballus*) and ass (*Equus asinus*). The increase in Equids from the Bronze Age to the Historic period reflected the development of breeding of these species, with occurrence being 1.3% NISP in the Middle and Late Bronze periods, 2.4% NISP in Iron I and II, 7.6% NISP in Iron III, and 4.8% NISP in the Achaemenid-Seleuco-Parthian period (Fig. 9).

Discussion and Conclusion

The results of this brief paper on the faunal analysis of Tepe Hasanlu provide possibilities for evaluating and examining the subsistence economy in the cultural sequences of the site from the beginning of the second millennium BC to the middle of the first millennium BC. The main subject of this paper was the animal exploitation patterns in the Iron Age, but the Bronze Age and Historic period were also examined to more accurately perceive the evolutions and changes that occurred in the system over time. The results indicated that domestic sheep, goat, and cattle were the most important animals exploited in all the periods. archaeozoological study results, along with other evidence, such as

architectural spaces, suitable environments, and archaeobotanical findings, pointed to developed agricultural activities (Harris, 1989). All such evidence support the existence of a sedentary society that relied on animal husbandry and farming. Among hunted animals, the most dominant were boar and deer, which are more adaptive to sylvan and semidry regions. Gazelles were rare given that their biological makeup is more compatible with steppe regions.

The proportion of cattle was considerably smaller than those of sheep and goats during the Middle to Late Bronze periods and the Iron I to II periods, whereas the proportion of cattle increased to approximately the same portion as Caprinae in the Iron III and Historic periods. The same trend was also observed for Equids, whose proportion increased from the Middle Bronze to the Historic periods. The practically unchanged proportion of the main species in all the periods indicated no major change in the general trend of animal consumption and production. However, two slight evolutionary changes were observed: the increase in Equids, which is especially clear when examining bone weight, and the increase in cattle, although this change occurred during the Historic period. The animal husbandry and herding strategies that were identified demonstrated that the products of Caprinae and cattle were the main sources of sustenance of Hasanlu inhabitants in all the periods. Some taphonomic traces on the phalanges and cervical vertebrae of cattle may be related to their function as draught animals, whether in agricultural activities or transport.

As indicated in the ancient records of New Assyria, Tepe Hasanlu was a province of

the Mannaeen government. On the basis of Assyrian records, sheep, cattle, horse, and two-humped camel were the dominant animals in the region. In the first millennium BC, the ancient northwestern powers of Iran used these livestock as tribute to the New Assyrian Empire. The current study of the faunal remains of Tepe Hasanlu corresponds with this historical evidence.

Note that camel bones are rare in the collection. Horse was one of the nurtured animals at Hasanlu in the beginning of the Iron Age to the end of the Historic period. The clear identification of horse bones, along with other archaeological finds, such as architectural remains of a stable, horse gear, and frenulum (bridle), pointed to the use of this animal for riding, especially during the Iron Age.

As mentioned above, other archaeozoological studies have been conducted in contemporaneous sites of northwestern Iran. Generally, the animal exploitation pattern observed in Tepe Hasanlu is similar to those in other northwestern Iranian sites for the same periods. These include Dinkhah Tepe, Haftavan Tepe, Bastam, Qalaychi, and Ziwiye. This evidence indicated the development of a specialized economy during the Iron Age to provisioning the requirements of a sedentary population. Further studies on other sites can illuminate the interactions between sedentary societies and pastoral nomads.

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References

- [1] Barone, R., (1986), *Anatomie Comparée des Mammifères Domestiques*, Paris: Vigot.
- [2] Boessneck, J. & R. Krauss, (1973), "Die Tierwelt um Bastam, Nordwest-Azerbaidjan", *Archäologische Mitteilungen aus Iran (AMI)*, Band 6: 113-133.
- [3] Bökönyi, S., (1978), "The Animal Remains, a Preliminary Report, 1973 and 1974", *Iran*, Vol. 16: 1-29.
- [4] Burney, Ch., (1994), "Contact and Conflict in North-Western Iran", *Iranica Antiqua*, Vol. 29: 47-62.
- [5] Casteel, R. W., (1978), "Faunal Assemblages and the Wiegemethods or Weight Method", *Journal of Field Archaeology*, Vol. 5: 71-77.
- [6] Cifarelli, M., (2014), "Personal Ornaments at Hasanlu, Iran", in *Polish Archaeology in the Mediterranean 23/2, Special Studies: Beyond ornamentation. Jewelry as an Aspect of Material Culture in the Ancient Near East*, A. Golani & Z. Wygnańska (eds.): 297-316.
- [7] Crawford, V. E., (1961), "Hasanlu 1960", *the Metropolitan Museum of Art Bulletin*, Vol. XX (3): 85-94.
- [8] Danti, M., (2004), *the Ilkhanid Heartland: Hasanlu Tepe (Iran) Period I*, Hasanlu Excavation Reports 2. Philadelphia: University of Pennsylvania Museum.
- [9] Danti, M., (2103a), "The Late Bronze and Early Iron Age in Northwestern Iran", in the *Oxford Handbook of Ancient Iran*. Daniel T. Potts (ed.), Oxford University Press: 327-376.
- [10] Danti, M., (2013b). *Hasanlu V: The Late Bronze and Iron I Periods*, Hasanlu Excavations Reports III, University of Pennsylvania Museum of Archaeology and Anthropology Philadelphia.
- [11] Danti, M. & M. Cifarelli, (2015), "Iron II Warrior Burials at Hasanlu Tepe, Iran", *Iranica Antiqua*, Vol. 50: 61-157.
- [12] Danti, M. D., M. M. Voigt & R. H. Dyson, (2004), "The Search for the Late Chalcolithic / Early Bronze Age Transition in the Ushnu-Solduz Valley, Iran". in *A View from the Highlands: Archaeological studies in honour of Charles Burney*, A. Sagona (ed.), *Ancient Near Eastern Studies*, Suppl. 12: 583-616
- [13] Davis, S. J. M., (1987), *Archaeology of Animals*. London B.T. Bastford Ltd.
- [14] Davoudi, H., (in prep.), *Subsistence Economy of Iron Age Societies in North-Western Iran Based on Archaeozoological Studies - the Case of Tepe Hasanlu*. PhD thesis in Archaeology, Tarbiat Modares University, Iran.

- [15] de Schauensee, M., (1989), "Horse Gear from Hasanlu", *Expedition*, Vol. 31 (2-3): 37-52.
- [16] de Schauensee, M., (ed.) (2012), *Peoples and Crafts in Period IVB at Hasanlu, Iran*, (Vol. 132), University of Pennsylvania Press.
- [17] Dyson, R. H., (1958), "Iron Age Hasanlu", *University Museum Bulletin*, Vol. 22: 25-32.
- [18] Dyson, R. H., (1959), "Digging in Iran: Hasanlu 1958", *Expedition*, Vol. 1: 4-18.
- [19] Dyson, R. H., (1960), "Where the Golden Bowl of Hasanlu Was Found: Excavations near Lake Urmia which Throw New Light on the Little-Known Mannaeans-part I", *Illustrated London News*, Vol. 236: 132-134.
- [20] "The Death of a City", *Expedition*, Vol. 2 (3): 2-11.
- [21] Dyson, R. H., (1962), "The Hasanlu Project: Archaeologists, Working with Natural Scientists, Delineate line in a 1000 B.C. Town of Azerbaijan", *Science*, Vol. 135: 637-647.
- [22] Dyson, R. H., (1965), "Problems of Protohistoric Iran as seen from Hasanlu", *JNES*, Vol. 24: 193-217.
- [23] Dyson, R. H., (1967). "Early Cultures of Solduz, Azerbaijan", in *A Survey of Persian Art* 14, A. U. Pope (ed.), London, Oxford University: 2951-2970.
- [24] Dyson, R. H., (1968). "The Archaeological Evidence of the Second Millennium B.C. on the Persian Plateau", *The Cambridge Ancient History*, Fasc. 66. Vol. II, Cambridge: Cambridge, University Press: 1-36.
- [25] Dyson, R. H., (1969), "A decade in Iran", *Expedition*, Vol. 11 (2): 39-47.
- [26] Dyson, R. H., (1972). "The Hasanlu Project, 1961-1967", in the *Memorial Volume of the International Congress of Iranian Art and Archaeology*, 1968, Vol. I: 39-58.
- [27] Dyson, R. H., (1973), "Hasanlu", *Iran*, Vol. 11: 195-196.
- [28] Dyson, R. H., (1975), "Hasanlu, 1974: The Ninth Century B.C. Gateway", in *Proceedings of the IIIrd Annual Symposium on Archaeological Research in Iran*, 2nd-7th November, 1974, F. Bagherzadeh (ed.), Tehran: Iranian Center for Archaeological Research: 179-188.
- [29] Dyson, R. H., (1983), "The Genesis of the Hasanlu Project", in *Hajji Firuz Tepe, Iran: the Neolithic Settlement*, M. M. Voigt (ed.), Pennsylvania: xxv-xxvii.
- [30] Dyson, R. H., (1989a), "The Iron Age Architecture at Hasanlu: an Essay", *Expedition*, Vol. 31 (2-3): 107-127.
- [31] Dyson, R. H., (1989b), "Rediscovering Hasanlu", *Expedition*, Vol. 31 (2-3): 3-11.
- [32] Dyson, R. H., (1999), "The Achaemenid Painted Pottery of Hasanlu IIIA", *Anatolian Studies*, Vol. 49: 101-110.
- [33] Dyson, R. H., (2004), "Memories of Hasanlu 1958 – the Discovery of the Golden Beaker", in *Persiens Antike Pracht*: 358-359.
- [34] Dyson, R. H. & V. Pigott, (1975). "Hasanlu", *Iran*, Vol. 13: 182-185.
- [35] Dyson, R. H. & O. W. Muscarella, (1989). "Construction the Chronology Historical Implications of Hasanlu", *Iran*, Vol. 27: 1-27.
- [36] Ghirshman, R., (1938), *Fouilles de Sialk, Volume I*, Paris: Geuthner.
- [37] Gilbert, A. S., (1979), *Urban Taphonomy of Mammalian Remains from Bronze Age of Godin, Western Iran*. Ph.D. Dissertation, Columbia University, Columbia.
- [38] Gilbert, A. S. & P. Steinfeld, (1977), "Faunal Remains from Dinkha Tepe, Northwestern Iran", *Journal of Field Archaeology*, Vol. 4, No. 3: 329-351.
- [39] Hakemi, A. & M. Rad, (1950), "Rapport et resultants de fouilles scientifiques à Hasanlu, Solduz", *Guzarishha-yi Bastan-Shinasi*, Vol. 1: 87-103.
- [40] Harris, M. V., (1989), "Glimpses of an Iron Age Landscape". *Expedition*, Vol. 31 (2-3): 12-23.
- [41] Hojabri Nobari, A., (2004), "Excavations of Masjed-e Kabud in Tabriz: It's Place among Contemporaneous Iranian Iron Age Sites", in *Proceedings of the International Symposium on Iranian Archaeology: Northwestern Region*, M. Azarnoush (ed.), Tehran: Iranian Center for Archaeological Research (in Persian): 265-276.

- [42] Khatib Shahidi, H., (2006), "Recent Investigations at Hasanlu and Reconsideration of its Upper Strata", *Humanities Journal*, Vol. 13, No. 3: 17-29.
- [43] Kolb, R., (1972), *Die Tierknochenfunde vom Takht-i Suleiman in der iranischen Provinz Aserbeidschan (Fundmaterial der Grabung (1969). Doctorate Thesis, Ludwig-Maximilian University, Munich.*
- [44] Krauss, R., (1975), *Tierknochen Funde aus Bastam in Nordwest-Azərbayjan, Iran, Munich.*
- [45] Kroll, S. (2013), "Hasanlu Period III – Annotations and Corrections", *Iranica Antiqua*, Vol. XLVIII: 175-195.
- [46] Lippert, A., (1979), "Die Österreichischen am Kordlar-Tepe in Persisch-Westaserbeidschan (1971-1978)", *AMI, Band 12*: 104-137.
- [47] Luckenbill, D. D., (1926), *Ancient Records of Assyria and Babylonia, Vol. I: Historical Records of Assyria from the Earliest Times to Sargon, The University of Chicago Press, Illinois.*
- [48] Luckenbill, D. D., (1927), *Ancient Records of Assyria and Babylonia. Vol. II: Historical Records of Assyria from Sargon to the End, The University of Chicago Press, Illinois.*
- [49] Magee, P., (2008), "Deconstructing the Destruction of Hasanlu: an Archaeological Evaluation", *Bulletin of the American Schools of Oriental Research*, Vol. 342: 69-94.
- [50] Marcus, M. I., (1988), *The Seals and Sealings from Hasanlu IVB, Iran. PhD Dissertation in History of Art, University of Pennsylvania.*
- [51] Marcus, M. I., (1989a), "Emblems of Authority: The Seals and Sealings from Hasanlu IVB", *Expedition*, Vol. 31 (2-3): 53-63.
- [52] Marcus, M. I., (1989b), "The Social Value of Sealings at Hasanlu IV B, Iran", *American Journal of Archaeology*, Vol. 93: 282-283.
- [53] Mashkour, M., F. Biglari & N. Ghafouri, (2012), "The Osteoarchaeological Project of the National Museum of Iran: An Interim Report", *Iranian Archaeology*, Vol. 3: 72-76.
- [54] Mashkour, M., M. Fontugne & C. Hatte, (1999), "Investigations on the Evolution of Subsistence Economy in the Qazvin Plain (Iran) from the Neolithic to the Iron Age", *Antiquity*, Vol. 73: 65-76.
- [55] Medvedskaya, I., (1982), *Iran: Iron Age I, BAR International Series 126. Oxford.*
- [56] Mohaseb, F. A., (2012), *Exploitation des Animaux Durant l'Age du Bronze au début de la Période Islamique dans le Nord ouest de l'Iran: étude Archéozoologique de Haftavan Tepe, PhD thesis, University Panthéon, Sorbonne, Paris.*
- [57] Mohaseb, F. A., (2013), "Animal Exploitation from the Bronze Age to the Early Islamic Period at Haftavan Tepe (Western Azerbaijan, Iran)", *Iranian Archaeology*, Vol. 4: 120-149 (in Persian).
- [58] Muscarella, O. W., (1971), "Hasanlu in the Ninth Century B.C. and its Relations with Other Cultural Centers of the Near East", *American Journal of Archaeology*, Vol. 75 (3): 263-266.
- [59] Muscarella, O. W., (2006), "The Excavations of Hasanlu: An Archaeological Evaluation", *Bulletin of the American Schools of Oriental Research*, Vol. 342: 69-94.
- [60] Nezamabadi, M., M. Mashkour & B. Kargar, (2011), "Mannaeen Faunal Remains from Tepe Qalaichi, Northwestern Iran (9th-7th B.C.)", *Iranian Archaeology*, Vol. 2: 33-40.
- [61] Pales, L. & M. A. Garcia, (1981), *Atlas Ostéologique pour servir à l'identification des Mammifères du Quaternaire (Vol. 2 Vols): Editions du Centre National de la Recherche Scientifique.*
- [62] Pales, L. & C. Lambert, (1971), *Atlas Osteologique. Editions du Centre National de la Recherche Scientifique, Antole-France, Paris-VII.*
- [63] Pigott, V. C., (1989), "The Emergence of Iron Use at Hasanlu", *Expedition*, Vol. 31 (2-3): 68-79.

- [64] Rackham, J., (1994), *Animal Bones. Interpreting the Past*. Berkeley, University of California Press.
- [65] Reade, J., (1979), "Hasanlu, Gilzanu, and Related Considerations", *Archaeologische Mitteilungen aus Iran*, Vol. 12: 175-181.
- [66] Saldern, A., (1966), "Mosaic Glass from Hasanlu, Marlik, and Tell Al-Rimah", *Journal of Glass Studies*, Vol. VIII: 9-16.
- [67] Salvini, M., (1995), *Geschichte und Kultur der Urartaer*, Darmstadt: Wissenschaftliche Buchgesellschaft.
- [68] Schmidt, E., (1972), *Atlas of Animal Bones: for Prehistorians, Archaeologists and Quaternary Geologists*: Elsevier Publishing Company.
- [69] Steiger, C., (1990), *Vergleichend morphologische Untersuchungen an Einzelknochen des postkranialen Skeletts der Altweltkamele*, Diss. Med. Vet. Munchen.
- [70] Stein, A., (1940), *Old Routes of Western Iran*, London.
- [71] Talai, H., (2007), "The Iron II (ca. 1200–800 B.C.) Pottery Assemblage at Haftavan IV, NW Iran", *Iranica Antiqua*, Vol. 42: 105-123.
- [72] Uerpmann, H. P., (1987), *The Ancient Distribution of Ungulate Mammals in the Middle East. Fauna and Archaeological Sites in Southwest Asia and Northwest Africa*, Wiesbaden: Ludwig Riechert Verlag.
- [73] Voigt, M. & R. H. Dyson, (1992), *The Chronology of Iran, ca. 8000–2000 B.C.* In *Chronologies in Old World Archaeology*, ed. R. Ehrich, 3rd. Chicago: University of Chicago Press: 122-178.
- [74] Von den Driesch, A., (1976), *A Guide to the Measurement of Animal Bones from Archaeological Sites*, Peabody Museum of Archaeology and Ethnology, Harvard University.
- [75] Winter, I. J., (1989), "The 'Hasanlu Gold Bowl': Thirty Years Later", *Expedition*, Vol. 31 (2-3): 87-106.
- [76] Young, T. C., (1965), "A Comparative Ceramic Chronology for Western Iran, 1500-500 B.C.", *Iran*, Vol. 3: 53-86.
- [77] Young, T. C., (1967), "The Iranian Migration in to the Zagros", *Iran*, Vol. 5: 11-34.

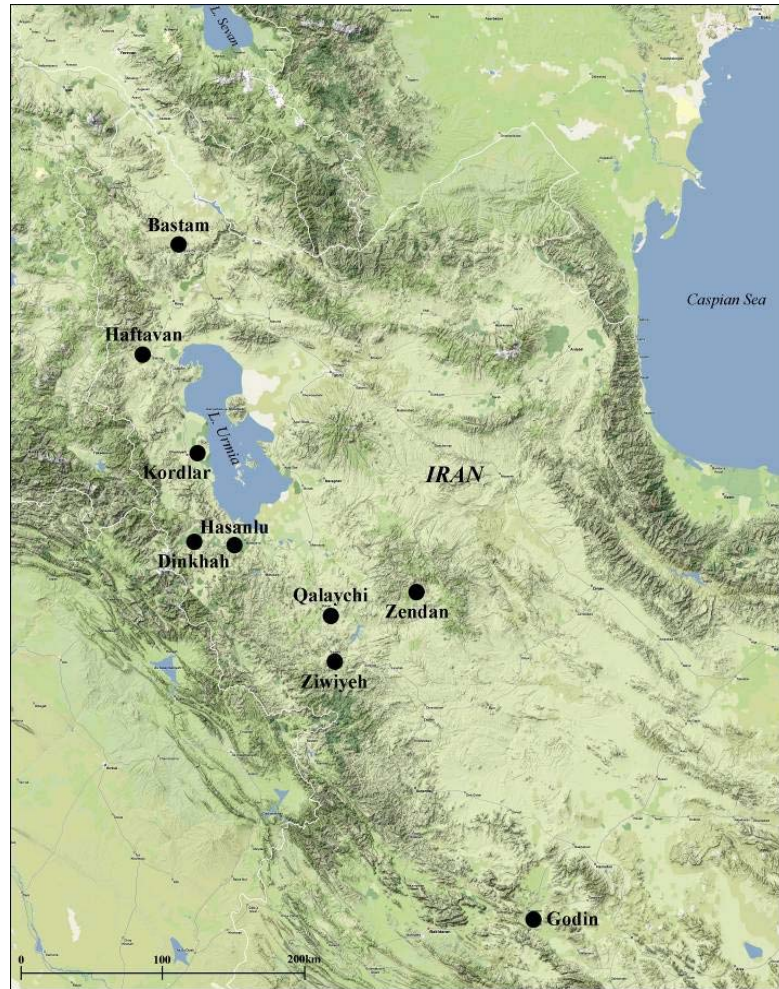


Fig. 1: Location of Tepe Hasanlu and Proposed Sites, Northwestern Iran.



Fig. 2: (left) General View of Tepe Hasanlu (Dyson, 2004: 2); (right) Contour Map of Hasanlu (Danti, 2013a: Fig. 17.2).

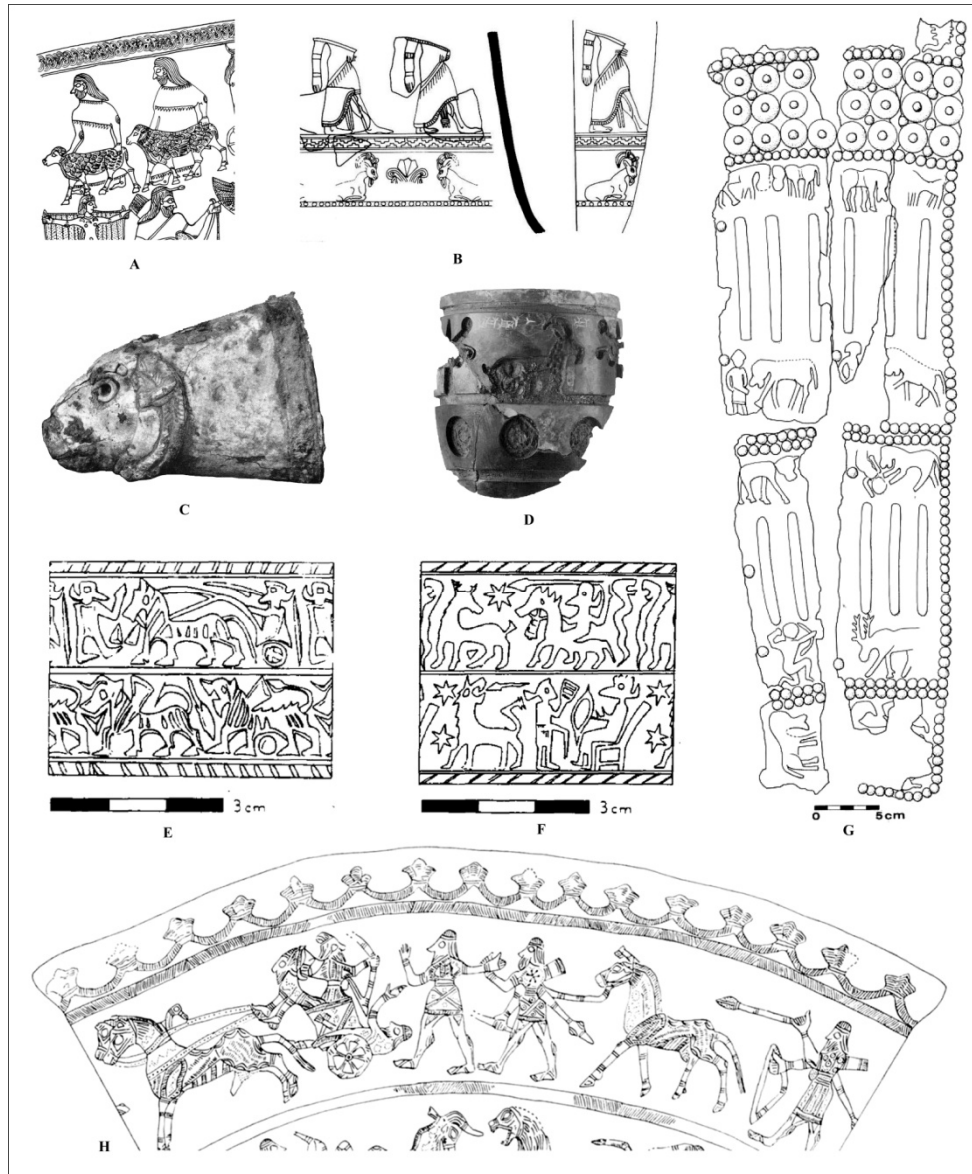


Fig. 3: A) Design of two sheep on the golden bowl of Hasanlu, Iron II (Winter, 1989: Fig. 6); B) Design of goat on the glass beaker of Hasanlu, Iron II (Saldern, 1966: Fig. 1); C) Bronze ram's-head rhyton with silver band and Egyptian-blue inlays, Iron II (Crawford, 1961: Fig. 7); D) A stone vessel bears a partially preserved cuneiform inscription and figure of goats and trees, Iron II (Pigott, 1989: Fig. 16); E) Cylinder seal with design of the scene of horse riding, horse-drawn chariot with four-spoke wheel and driver in upper register, the winged bull and winged lion in lower register, Iron II (Marcus, 1988: 92, No. 1); F) Sealing with design of the scene of deer hunting, the hunter on horseback, the horse wears a bell, two vertical snakes, and a deer (stag) having antlers with two tines each, Iron II (Marcus, 1988: 104, No. 5); G) Deer hunting design on the iron quiver, Iron II (Pigott, 1989: Fig. 14); H) Design of horse on the silver beaker, Iron II (Marcus, 1989a: Fig. 1).

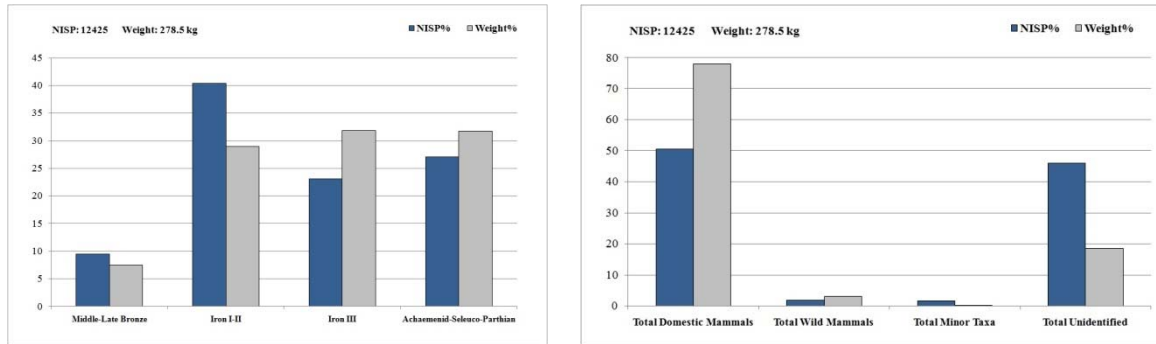


Fig. 4 (left): Distribution of Bone Remains within cultural periods; **Fig. 5** (right): Comparing Number and Weight of Identified and Unidentified Remains in Assemblage.



Fig. 6: A) Distal end of humerus of goat, Seleuco-Parthian; B) First phalanx of sheep, Iron II; C) Distal end of humerus of boar, Seleuco-Parthian; D) Horn core of gazelle, Middle Bronze; E) Heavy cut marks on the distal end of humerus of cattle, Iron III; F) Modification on the talus of cattle, Iron II; G) Metatarsal of cattle, Iron II; H) Metatarsal of horse, Achaemenid; I) Metatarsal of reed deer, Iron II; J) Pathological trace on the first phalanx of cattle, Late Bronze; K) Canid biting on distal end of metacarpal of cattle, Achaemenid.

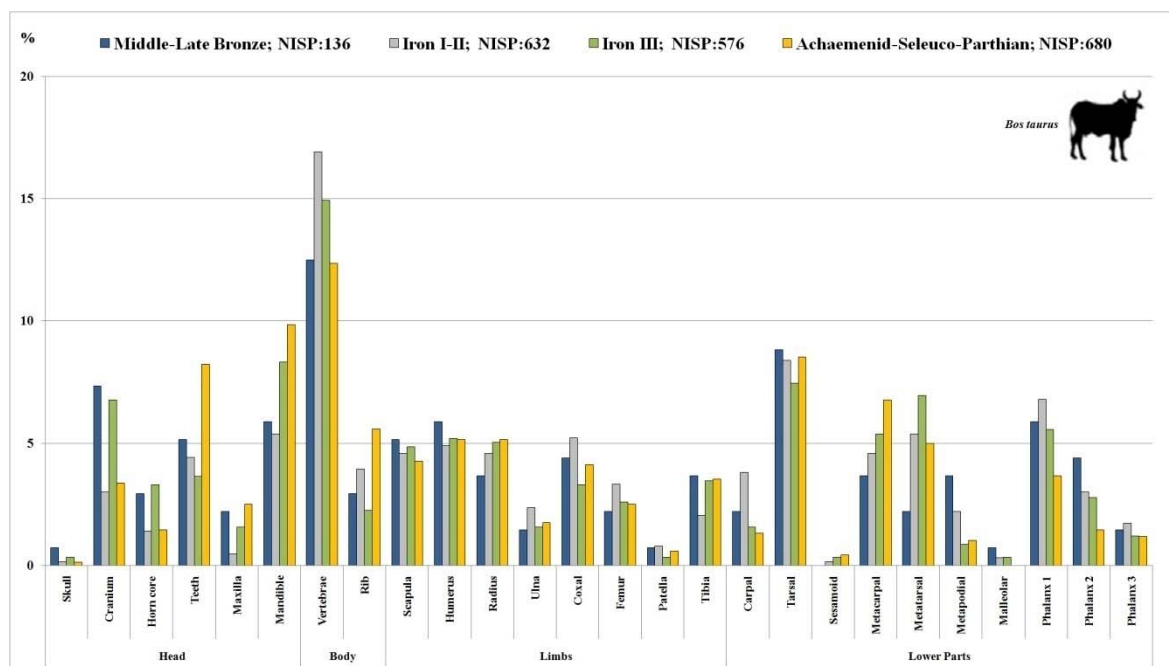


Fig. 7: Frequency of Skeletal Parts for Cattle (*Bos taurus*).

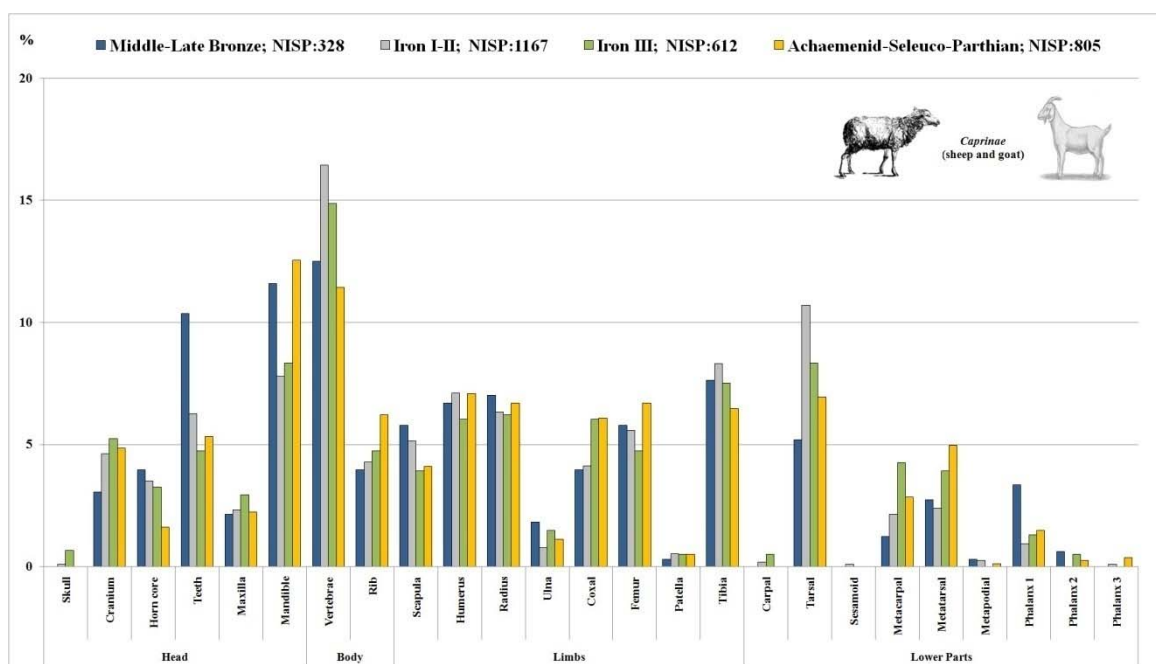


Fig. 8: Frequency of Skeletal Parts for Caprinae (Sheep and Goat).

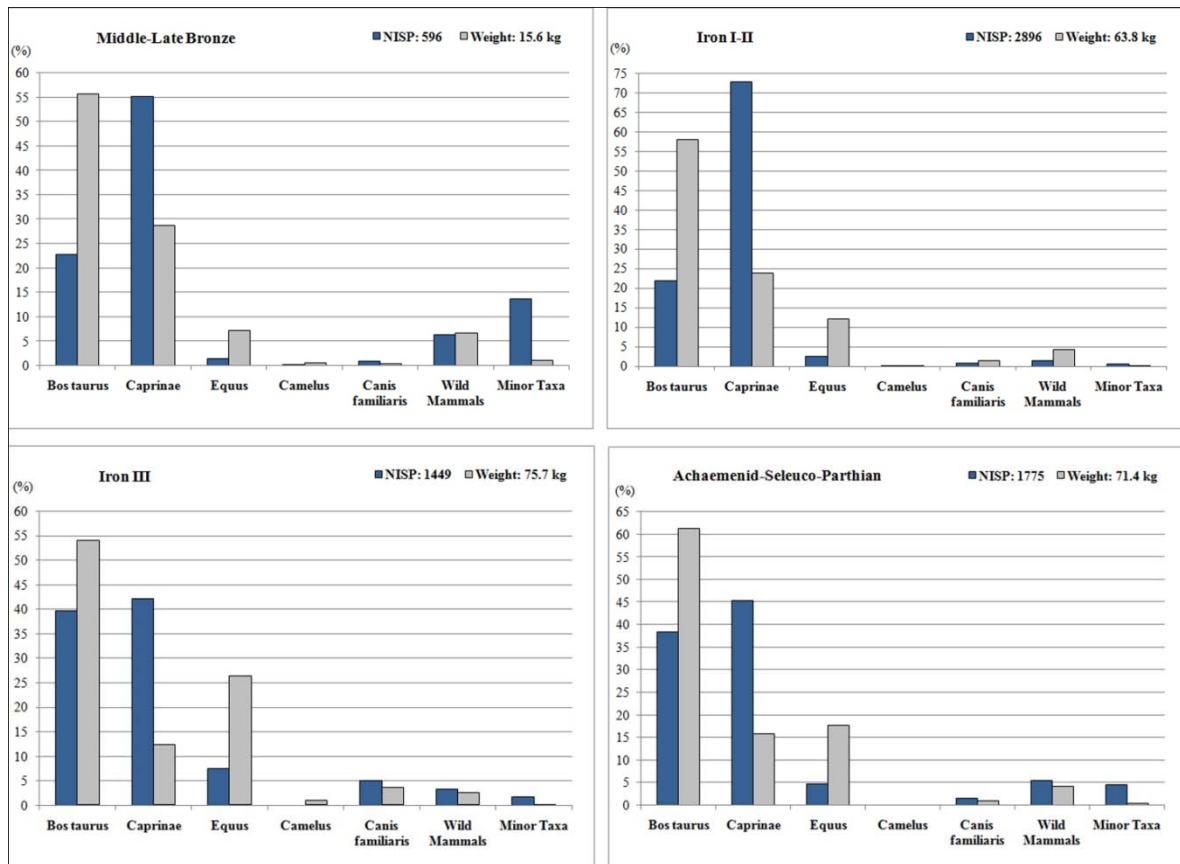


Fig 9: Percentage of Number and Weight of Identified Specimens (Domesticated, Wild and Minor Taxa), Middle Bronze Age to Parthian Period.

اقتصاد معیشتی شمال غرب ایران در عصر آهن:

مطالعه موردی تپه حسنلو

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شمال غرب ایران به عنوان یکی از مناطق کلیدی در مطالعات باستان شناسی به ویژه در عصر آهن و آغاز حکومت ها مورد توجه باستان شناسان مختلف بوده است. تپه حسنلو به سبب کاوش های گسترده و توالی گاهنگاری موجود در آن از جمله مهم ترین محوطه های منطقه است که مطالعات به نسبت کاملی روی مواد فرهنگی مختلف آن به انجام رسیده است. پیش از این، مطالعات جامعی روی بازمانده های استخوانی حیوانی حسنلو انجام نشده بود و در این نوشتار به نتایج حاصل از مطالعات جدید باستان جانورشناسی در این محوطه پرداخته شده است. بقایای جانوری حاصل از کاوش سال های ۱۹۷۰، ۱۹۷۲ و ۱۹۷۴ در حسنلو که در بخش استخوان شناسی موزه ملی ایران نگهداری می شوند، مورد تحقیق قرار گرفته اند. هدف از نوشتار حاضر، شناسایی روند اقتصاد زیستی و الگوهای معیشتی در عصر آهن تپه حسنلو است. برای درک تحولات و تغییرات به وجود آمده در نظام معیشتی عصر آهن، بقایای استخوانی حیوانی دوره مفرغ میانه و جدید و دوران تاریخی (هخامنشی، سلوکی، اشکانی) نیز مورد بررسی قرار گرفته اند. در نتیجه مطالعات انجام شده، حسنلو در تمام دوره های مذکور، دامپروری پیشرفته داشته و گاو، گوسفند و بز اهلی اصلی ترین منبع مصرفی آنها بوده و اسب سنان نیز به میزان چشم گیری به ویژه در عصر آهن پرورش داده شده اند. چنین الگویی همچنین در محوطه های همزمان در شمال غرب ایران نظیر هفتوان تپه و دینخواه تپه نیز شناسایی شده است.

واژه های کلیدی: شمال غرب ایران، باستان جانورشناسی، بقایای استخوانی حیوانی، دامپروری.

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